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Installing Gigabit Interface Converters and Small Form Factor Pluggable Gigabit Interface Converters

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Meets requirements of:

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EN55022: 1998/CISPR22:1997), Class A
General License VDE 0871, Class B
(AmtsblVfg No. 243/1991, Vfg 46/1992) VCCI Class A ITE
EN55024:1998/CISPR24:1997

Caution: Use of controls or adjustments, or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Caution: Only qualified technicians should install this equipment.

Place all printed circuit boards on an antistatic mat until you are ready to install them. If you do not have an antistatic mat, wear a discharge leash to free yourself of static before touching any of the printed circuit boards, or free yourself of static by touching a grounded metal object before handling a printed circuit board.

Product Safety

Meets requirements of:

CSA 22.2 No. 950-M95/UL1950, 3rd ed.
EN60950: 1992 /A1:1993 /A2:1993 /A3:1995 /A4:
199721CFR, Chapter I
EN60825-1:1994 /A11:1996

Warning: Fiber optic equipment can emit laser or infrared light that can injure your eyes. Never look into an optical fiber or connector port. Always assume that fiber optic cables are connected to a light source.

Vorsicht: Glasfaserkomponenten können Laserlicht bzw. Infrarotlicht abstrahlen, wodurch Ihre Augen geschädigt werden können. Schauen Sie niemals in einen Glasfaser-LWL oder ein Anschlußteil. Gehen Sie stets davon aus, daß das Glasfaserkabel an eine Lichtquelle angeschlossen ist.

Avertissement: L'équipement à fibre optique peut émettre des rayons laser ou infrarouges qui risquent d'entraîner des lésions oculaires. Ne jamais regarder dans le port d'un connecteur ou d'un câble à fibre optique. Toujours supposer que les câbles à fibre optique sont raccordés à une source lumineuse.

Advertencia: Los equipos de fibra óptica pueden emitir radiaciones de láser o infrarrojas que pueden dañar los ojos. No mire nunca en el interior de una fibra óptica ni de un puerto de conexión. Suponga siempre que los cables de fibra óptica están conectados a una fuente luminosa.

Avvertenza: Le apparecchiature a fibre ottiche emettono raggi laser o infrarossi che possono risultare dannosi per gli occhi. Non guardare mai direttamente le fibre ottiche o le porte di collegamento. Tenere in considerazione il fatto che i cavi a fibre ottiche sono collegati a una sorgente luminosa.

警告：光ファイバ装置は目に有害なレーザー光や赤外線を放射することがあります。光ファイバやコネクタ・ポートを覗き込まないでください。光ファイバ・ケーブルは光源に接続されているものと思ってください。

Introduction to Gigabit Interface Converters

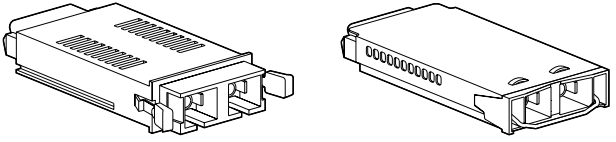
This section describes the Gigabit Interface Converter (GBIC) and label, and provides a GBIC model list.

Product description

Gigabit Interface Converters (GBICs) are hot-swappable input/output enhancement components designed for use with Nortel Networks* products to allow Gigabit Ethernet ports to link with fiber optic networks.

Figure 1 shows the two GBIC insertion and removal mechanisms—extractor tabs and extractor handle.

Figure 1 GBIC extraction tabs and extractor handle



GBIC model with extractor tabs

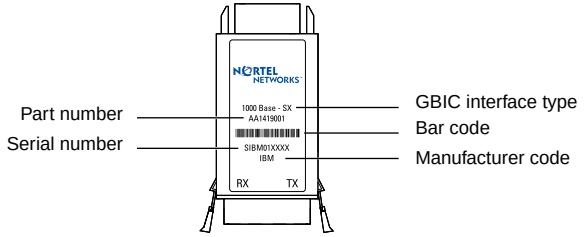
GBIC model with extractor handle

9702FA

GBIC labeling

The Nortel Networks label on a typical GBIC (Figure 2) contains a Nortel Networks serial number, a bar code, a manufacturer's code, an interface type, and a part number.

Figure 2 Nortel Networks GBIC label



9706EA

Note: When you contact a Nortel Networks service representative for troubleshooting purposes, you must have the following information available:

- Nortel Networks serial number
- Manufacturer's code
- Interface type
- GBIC part number

GBIC and SFP GBIC model list

Table 1 lists and describes the Nortel Networks GBIC and SFP GBIC models.

Table 1 Nortel Networks GBIC and SFP GBIC models

Model number	Product number	Description
1000BASE-SX	AA1419001	Short wavelength/ distance 550 m
1000BASE-LX	AA1419002	Long wavelength distance 5 km
1000BASE-XD	AA1419003	Extended distance 50 km
1000BASE-ZX	AA1419004	Extended distance 70 km

Note: GBIC wavelength distance may vary, depending on the quality of fiber optic cable used.

Handling, safety, and environmental guidelines

Before installing your GBIC, read the following handling, safety, and environmental guidelines:

- GBICs are static sensitive. To prevent damage from electrostatic discharge (ESD), follow your normal board and component handling procedures.
- GBICs are dust sensitive. When you store a GBIC, or when you disconnect it from a fiber optic cable, always keep the dust cover over the GBIC's optical bores.
- To clean contaminants from the optical bores of a GBIC, use an alcohol swab or equivalent to clean the ferrules of the optical connector.
- Dispose of this product according to all national laws and regulations.

Warning: Fiber optic equipment can emit laser or infrared light that can injure your eyes. Never look into an optical fiber or connector port. Always assume that fiber optic cables are connected to a light source.

Installing a GBIC

This section lists the steps to install a GBIC.

To install a GBIC:

1 Remove the GBIC from its protective packaging.

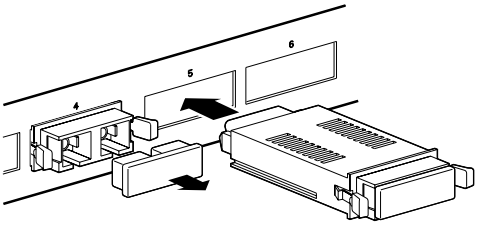
2 Verify that the GBIC is the correct model for your network configuration (Table 1 on page 4).

3 Remove the dust cover from the GBIC's optical bores.

4 Grasp the GBIC between your thumb and forefinger.

5 Insert the GBIC into the slot on the front panel of the Gigabit Ethernet switching module (Figure 3) .

Figure 3 Inserting the GBIC into the switching module



Note: GBICs are keyed to prevent incorrect insertion.

Removing a GBIC

This section lists the steps for removing a GBIC.

To remove a GBIC:

1 Disconnect the network fiber cable from the GBIC connector.

2 Depending on your GBIC model, either grasp the extraction tabs (Figure 1) located on either side of the GBIC with your thumb and forefinger, or lift the extractor handle (Figure 1) attached to the GBIC.

3 Slide the GBIC out of the Gigabit Ethernet module slot.

4 If the GBIC does not slide easily from the module slot, use a gentle side-to-side rocking motion while firmly pulling the GBIC from the slot.

5 Dispose of the GBIC according to all national laws and regulations.

Note: If you are storing a GBIC, remember to place a dust cover over the fiber optic bores.

GBIC specifications

Table 2 describes general GBIC specifications.

Table 2 GBIC specifications

Specification	Descriptions
Dimensions (H x W x D)	0.39 x 1.18 x 2.56 inches (1 x 3 x 6.5 cm)
Connectors	Multimode fiber optic: SC Single-mode fiber optic: SC

Standards, connectors, cabling, and distance

This section describes GBIC standards, connectors, cabling, and distance; and provides specifications for the following GBICs:

- “1000BASE-SX,” next
- “1000BASE-LX” on page 9
- “1000BASE-XD” on page 11
- “1000BASE-ZX” on page 13

GBIC ports for both multimode and single-mode fiber have SC-type connectors and a minimum cable distance of 6.5 feet (2 m).

1000BASE-SX

The Model 1000BASE-SX GBIC provides 1000BASE-SX (850 nm, short wavelength, Gigabit Ethernet) connectivity using SC duplex multimode fiber connectors.The Model 1000BASE-SX GBIC supports full-duplex operation only.

Table 3 describes standards, connectors, cabling, and distance for the Model 1000BASE-SX GBIC.

Table 3 1000BASE-SX specifications

Type	Specifications
Standards	Conformity to the following standards: 802.3z, 1000BASE-SX
Connectors	Duplex SC fiber optic connector

Table 3 1000BASE-SX specifications (continued)

Type	Specifications
Cabling	62.5 μm MMF optic cable 50 μm MMF optic cable
Distance	902 ft. (275 m) using 62.5 μm MMF optic cable 1804 ft. (550 m) using 50 μm MMF optic cable
Wavelength	850 nm
Optical budget	7 dB
Laser Transmitter Characteristics	
Minimum launch power	-10 dBm
Maximum launch power	-4 dBm
Receiver Characteristics	
Minimum receiver sensitivity	-17 dBm
Maximum input power	0 dBm

1000BASE-LX

The Model 1000BASE-LX GBIC provides 1000BASE-LX (1300 nm, wavelength, Gigabit Ethernet) connectivity using SC duplex fiber connectors. The long wavelength optical transceivers used in the LX model provide variable distance ranges using both multimode and single-mode fiber optic cabling. The Model 1000BASE-LX GBIC supports full-duplex operation only.

Table 4 describes standards, connectors, cabling, and distance for the Model 1000BASE-LX GBIC.

Table 4 1000BASE-LX specifications

Type	Specifications
Standards	Conformity to the following standards: 802.3z, 1000BASE-LX
Connectors	Duplex LC fiber optic connector
Cabling	62.5 µm MMF optic cable 50 µm MMF optic cable 10 µm SMF optic cable
Distance	1804 ft. (550 m) using 62.5 µm MMF optic cable 1804 ft. (550 m) using 50 µm MMF optic cable 16405 ft. (5 km) using 10 µm SMF optic cable
Wavelength	1300 nm
Optical budget	10.5 dB
Laser Transmitter Characteristics	
Minimum launch power	-9.5 dBm
Maximum launch power	-3 dBm
Receiver Characteristics	
Minimum receiver sensitivity	-20 dBm
Maximum input power	-3 dBm

Note: When multimode fiber is used in long-distance applications, external, removable, mode-conditioning patch cords may be required to prevent differential mode delay (DMD). You can order mode conditioning patch cords through Nortel Networks:

- SC-SC Mode-Conditioning Patch Cord 62.5/125 (part number AA0018035)
- SC-SC Mode-Conditioning Patch Cord 50/125 (part number AA0018036)

1000BASE-XD

The Model 1000BASE-XD GBIC provides Gigabit Ethernet connectivity using SC duplex single-mode fiber connectors. High-performance optical transceivers enable Gigabit Ethernet link distances up to 50 kilometers (km) over single-mode fiber. The ports operate in full-duplex mode only.

Note: The Model 1000BASE-XD GBIC is based on proprietary signaling and is compatible with Accelar 1000 Series XD modules.

Table 5 describes standards, connectors, cabling, and distance for the Model 1000BASE-XD GBIC.

Table 5 1000BASE-XD GBIC specifications

Type	Specifications
Standards	Conformity to the following standards: 802.3z, Ethernet full duplex

Table 5 1000BASE-XD GBIC specifications (continued)

Type	Specifications
Connectors	Duplex SC single-mode fiber optic connector
Cabling	Single-mode fiber optic cable
Distance	Up to 50 km using single-mode fiber cable, depending on the quality of the fiber
Optical budget	17 dB
Laser Transmitter Characteristics	
Wavelength	1550 ± 10 nm
Maximum spectral width	0.2 nm
Maximum launch power	0 dBm or 1.0 mW
Minimum launch power into fiber	-5 dBm or 0.3 mW
Distance	50 km
Receiver Characteristics	
Wavelength	1200 to 1550 nm
Minimum receiver sensitivity	-22 dBm
Maximum input power	-3 dBm

Note: Nortel Networks recommends that you use an in-line attenuator for shorter link distances to avoid overloading the receiver.

1000BASE-ZX

The Model 1000BASE-ZX GBIC provides Gigabit Ethernet connectivity using SC duplex single-mode fiber connectors. High-performance optical transceivers enable Gigabit Ethernet link distances up to 70 km over single-mode fiber cable. The ports operate in full-duplex mode only.

Note: The 1000BASE-ZX Model GBIC is based on proprietary signaling. Nortel Networks recommends that this product be used only with other Nortel Networks 1000BASE-ZX GBICs.

Table 6 describes standards, connectors, cabling, and distance for the Model 1000BASE-ZX GBIC.

Table 6 1000BASE-ZX GBIC specifications

Type	Specifications
Standards	Conformity to the following standards: 802.3z, Ethernet full duplex
Connectors	Duplex SC single-mode fiber optic connector
Cabling	Single-mode fiber cable
Distance	Up to 70 km using single-mode fiber cable, depending on the quality of the fiber
Optical Budget	22 dB
Laser Transmitter Characteristics	
Wavelength	1550 ± 10 nm
Maximum spectral width	0.2 nm
Maximum launch power	5 dBm or 3.0 mW
Minimum launch power	0 dBm

Table 6 1000BASE-ZX GBIC specifications (continued)

Type	Specifications
Distance	70 km
Receiver Characteristics	
Wavelength	1200 to 1550 nm
Minimum receiver sensitivity	-22 dBm
Maximum input power	-3 dBm

Note: When shorter lengths of single-mode fiber cable are used, there is a risk of overloading the receiver. It may be necessary to insert an in-line optical attenuator in the link to prevent overloading, as follows:

- Insert a 10 dB in-line optical attenuator between the fiber optic cable plant and the receiving port on the 1000BASE-ZX GBIC, at each end of the link, if the fiber optic cable span is less than 25 km.
- Insert a 5 dB in line optical attenuator between the fiber optic cable plant and the receiving port on the 1000BASE-ZX GBIC, at each end of the link, if the fiber optic cable span is less than 50 km.

Introduction to Small Form Factor Pluggable (SFP) Gigabit Interface Converters

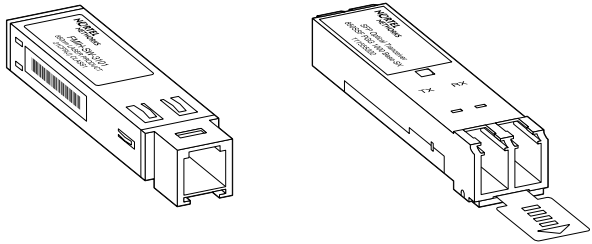
This section describes the Small Form Factor Pluggable (SFP) Gigabit Interface Converter (GBIC) and label, and provides a SFP GBIC model list.

Product description

Small Form Factor Pluggable Gigabit Interface Converters (SFP GBICs) are hot-swappable input/output enhancement components designed for use with Nortel Networks* products to allow Gigabit Ethernet ports to link with fiber optic networks.

Figure 4 shows the SFP GBIC

Figure 4 SFP GBIC



MTRJ GBIC model with extractor button

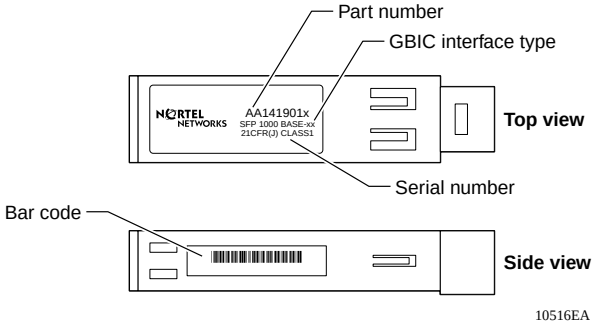
LC GBIC model with extractor tab

10515FA

SFP GBIC labeling

The Nortel Networks label on a typical SFP GBIC (Figure 5) contains a Nortel Networks serial number, a bar code, a manufacturer's code, an interface type, and a part number.

Figure 5 Nortel Networks SFP GBIC label



Note: When you contact a Nortel Networks service representative for troubleshooting purposes, you must have the following information available:

- Nortel Networks serial number
- Manufacturer's code
- Interface type
- GBIC part number

SFP GBIC model list

Table 7 lists and describes the Nortel Networks SFP GBIC models.

Table 7 Nortel Networks SFP GBIC models

Model number	Product number	Description
1000BASE-SX (LC Type)	AA1419013	Small Form Factor Pluggable, short wavelength 550 m
1000BASE-SX (MT-RJ Type)	AA1419014	Small Form Factor Pluggable, short wavelength 550 m
1000BASE-LX (LC Type)	AA1419015	Small Form Factor Pluggable, long wavelength 5 km

Note: The cable distance may vary depending on the quality of fiber optic cable used.

Handling, safety, and environmental guidelines

Before installing your SFP GBIC, read the following handling, safety, and environmental guidelines:

- SFP GBICs are static sensitive. To prevent damage from electrostatic discharge (ESD), follow your normal board and component handling procedures.

- SFP GBICs are dust sensitive. When you store a SFP GBIC, or when you disconnect it from a fiber optic cable, always keep the dust cover over the SFP GBIC's optical bores.
- To clean contaminants from the optical bores of a SFP GBIC, use an alcohol swab or equivalent to clean the ferrules of the optical connector.
- Dispose of this product according to all national laws and regulations.

Warning: Fiber optic equipment can emit laser or infrared light that can injure your eyes. Never look into an optical fiber or connector port. Always assume that fiber optic cables are connected to a light source.

Installing a Small Form Factor Pluggable (SFP) GBIC

This section lists the steps to install a SFP GBIC.

To install a SFP GBIC:

1. Remove the SFP GBIC from its protective packaging.
2. Verify that the SFP GBIC is the correct model for your network configuration (Table 7 on page 17).
3. Remove the dust cover from the SFP GBIC's optical bores.
4. Grasp the SFP GBIC between your thumb and forefinger.
5. Insert the SFP GBIC into the slot on the front panel of the Gigabit Ethernet switching module (Figure 7) .

Figure 6 Inserting a LC SFP GBIC

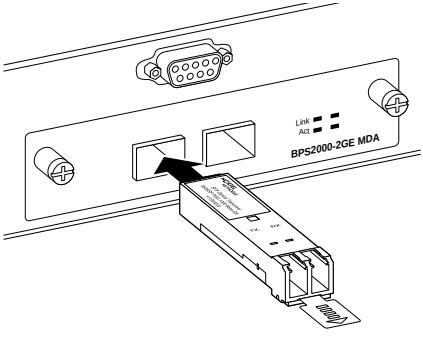
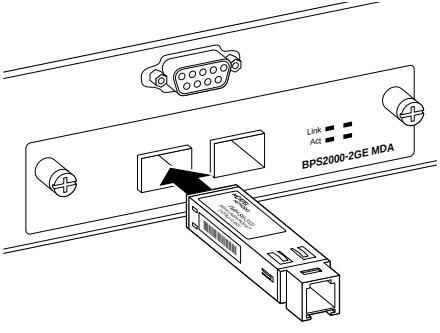


Figure 7 Inserting a MT-RJ SFP GBIC



Note: SFP GBICs are keyed to prevent incorrect insertion.

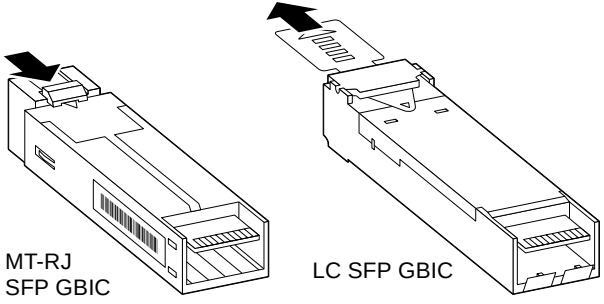
Removing a Small Form Factor Pluggable (SFP) GBIC

This section lists the steps for removing a GBIC.

To remove a GBIC:

1. Disconnect the network fiber cable from the SFP GBIC connector.
2. Depending on your SFP GBIC model, either pull the LC extraction tab located in the front of the SFP GBIC (below right) with your thumb and forefinger, or press the button on the bottom of the MT-RJ SFP GBIC (below left).

Figure 8 Removing a SFP GBIC (Bottom view)



3. Slide the SFP GBIC out of the Gigabit Ethernet module slot.
4. If the SFP GBIC does not slide easily from the module slot, use a gentle side-to-side rocking motion while firmly pulling the SFP GBIC from the slot.

5 Dispose of the SFP GBIC according to all national laws and regulations.

Note: If you are storing a SFP GBIC, remember to place a dust cover over the fiber optic bores.

Small Form Factor Pluggable (SFP) GBIC specifications

Table 8 describes general SFP GBIC specifications.

Table 8 Small Form Factor Pluggable (SFP) GBIC specifications

Specification	Descriptions
Dimensions (H x W x D)	0.53 x 0.33 x 2.22 inches (13.4 x 8.5 x 56.4 mm)
Connectors	Multimode fiber optic: LC or MT-RJ Single-mode fiber optic: LC or MT-RJ

Standards, connectors, cabling, and distance

This section describes SFP GBIC standards, connectors, cabling, and distance; and provides specifications for the following SFP GBICs:

- “1000BASE-SX (LC Type)” on page 22
- “1000BASE-LX (LC Type)” on page 23
- “1000BASE-SX (MT-RJ Type)” on page 24

1000BASE-SX (LC Type)

The Model 1000BASE-SX SFP GBIC provides 1000BASE-SX (850 nm, short wavelength, Gigabit Ethernet) connectivity using LC duplex multimode fiber connectors.The Model 1000BASE-SX SFP GBIC supports full-duplex operation only.

Table 9 describes standards, connectors, cabling, and distance for the Model 1000BASE-SX SFP GBIC.

Table 9 1000BASE-SX SFP GBIC specifications

Type	Specifications
Standards	Conformity to the following standards: 802.3z, 1000BASE-SX
Connectors	Duplex LC fiber optic connector
Cabling	62.5 µm MMF optic cable 50 µm MMF optic cable
Distance	902 ft. (275 m) using 62.5 µm MMF optic cable 1804 ft. (550 m) using 50 µm MMF optic cable
Wavelength	850 nm
Optical budget	7 dB
Laser Transmitter Characteristics	
Minimum launch power	-10 dBm

Table 9 1000BASE-SX SFP GBIC specifications (continued)

Type	Specifications
Maximum launch power	-4 dBm
Receiver Characteristics	
Minimum receiver sensitivity	-17 dBm
Maximum input power	0 dBm

1000BASE-LX (LC Type)

The Model 1000BASE-LX SFP GBIC provides 1000BASE-LX (1300 nm, wavelength, Gigabit Ethernet) connectivity using LC duplex fiber connectors. The long wavelength optical transceivers used in the LX model provide variable distance ranges using both multimode and single-mode fiber optic cabling. The Model 1000BASE-LX GBIC supports full-duplex operation only.

Table 10 describes standards, connectors, cabling, and distance for the Model 1000BASE-LX GBIC.

Table 10 1000BASE-LX SFP GBIC specifications

Type	Specifications
Standards	Conformity to the following standards: 802.3z, 1000BASE-LX
Connectors	Duplex LC fiber optic connector

Table 10 1000BASE-LX SFP GBIC specifications (continued)

Type	Specifications
Cabling	62.5 µm MMF optic cable 50 µm MMF optic cable 10 µm SMF optic cable
Distance	1804 ft. (275 m) using 62.5 µm MMF optic cable 1804 ft. (275 m) using 50 µm MMF optic cable 16405 ft. (5 km) using 10 µm SMF optic cable
Wavelength	1300 nm
Optical budget	10.5 dB
Laser Transmitter Characteristics	
Minimum launch power	-9.0 dBm
Maximum launch power	-3 dBm
Receiver Characteristics	
Minimum receiver sensitivity	-20 dBm
Maximum input power	-3 dBm

1000BASE-SX (MT-RJ Type)

The Model 1000BASE-SX (MT-RJ Type) SFP GBIC provides Gigabit Ethernet connectivity using MT-RJ multi-mode fiber connectors.

Table 11 describes standards, connectors, cabling, and distance for the Model 1000BASE-SX (MT-RJ Type) SFP GBIC.

Table 11 1000BASE-SX (MT-RJ Type) SFP GBIC specifications

Type	Specifications
Standards	Conformity to the following standards: 802.3z, Ethernet full duplex
Connectors	Duplex MT-RJ fiber optic connector
Cabling	62.5 µm MMF optic cable 50 µm MMF optic cable
Distance	275 mm (62.5 µm MMF optic cable) 550 mm (50 µm MMF optic cable)
Optical budget	7 dB
Laser Transmitter Characteristics	
Wavelength	850 nm
Maximum spectral width	0.85 nm
Maximum launch power	-4.0 dBm
Minimum launch power into fiber	-9.5 dBm
Receiver Characteristics	
Wavelength	850 nm
Minimum receiver sensitivity	-17 dBm
Maximum input power	0 dBm

Connecting to Nortel Networks online

This section describes products, services, and support systems that can be accessed online.

Hard-copy technical manuals

You can print selected technical manuals and release notes free, directly from the Internet. Go to the www.nortelnetworks.com/documentation URL. Find the product for which you need documentation. Then locate the specific category and model or version for your hardware or software product. Use Adobe* Acrobat Reader* to open the manuals and release notes, search for the sections you need, and print them on most standard printers. Go to Adobe Systems at the www.adobe.com URL to download a free copy of the Adobe Acrobat Reader.

You can purchase selected documentation sets, CDs, and technical publications through the Internet at the www1.fatbrain.com/documentation/nortel/ URL.

How to get help

If you purchased a service contract for your Nortel Networks product from a distributor or authorized reseller, contact the technical support staff for that distributor or reseller for assistance.

If you purchased a Nortel Networks service program, contact one of the following Nortel Networks Technical Solutions Centers:

Technical Solutions Center	Telephone
Europe, Middle East, and Africa	(33) (4) 92-966-968
North America	(800) 4NORTEL or (800) 466-7835
Asia Pacific	(61) (2) 9927-8800
China	(800) 810-5000

An Express Routing Code (ERC) is available for many Nortel Networks products and services. When you use an ERC, your call is routed to a technical support person who specializes in supporting that product or service. To locate an ERC for your product or service, go to the www12.nortelnetworks.com/ URL and click ERC at the bottom of the page.